Feb. 21, 1967 W. B. HALL, JR 3,305,162

REFRIGERATING APPARATUS

Filed July 27, 1964

3 Sheets-Sheet 1

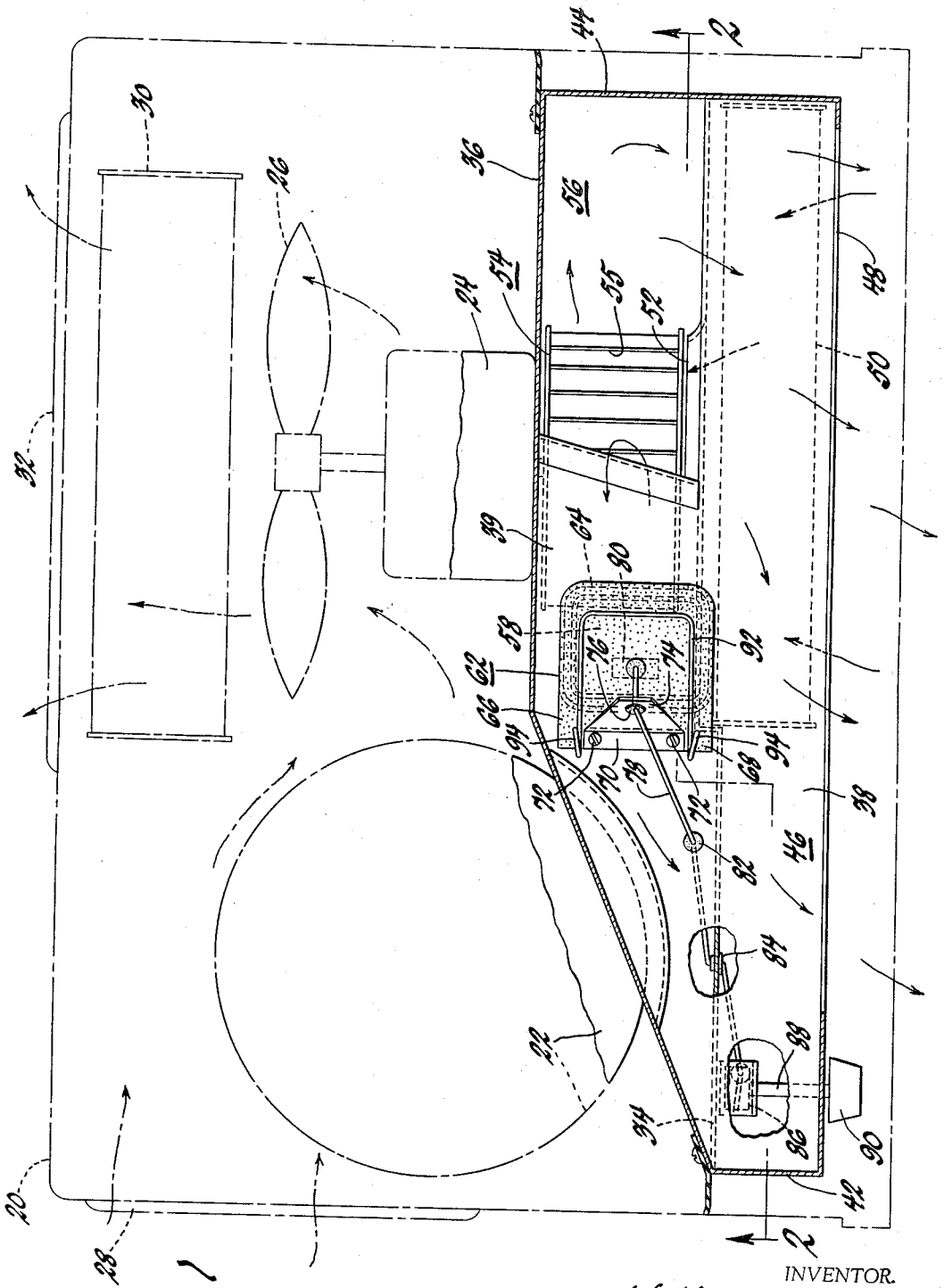


Fig. 1

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REFRIGERATING APPARATUS

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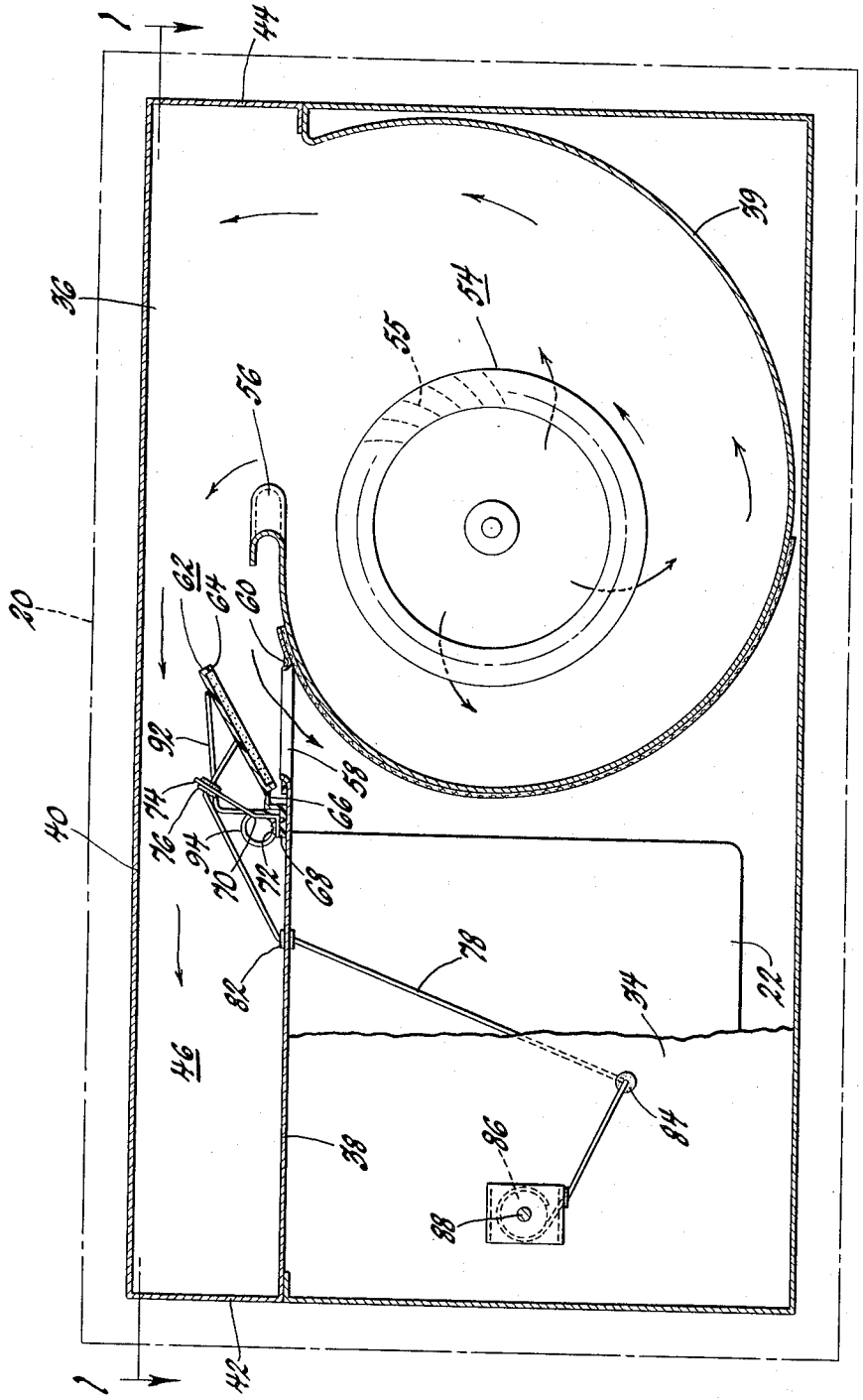


Fig. 2

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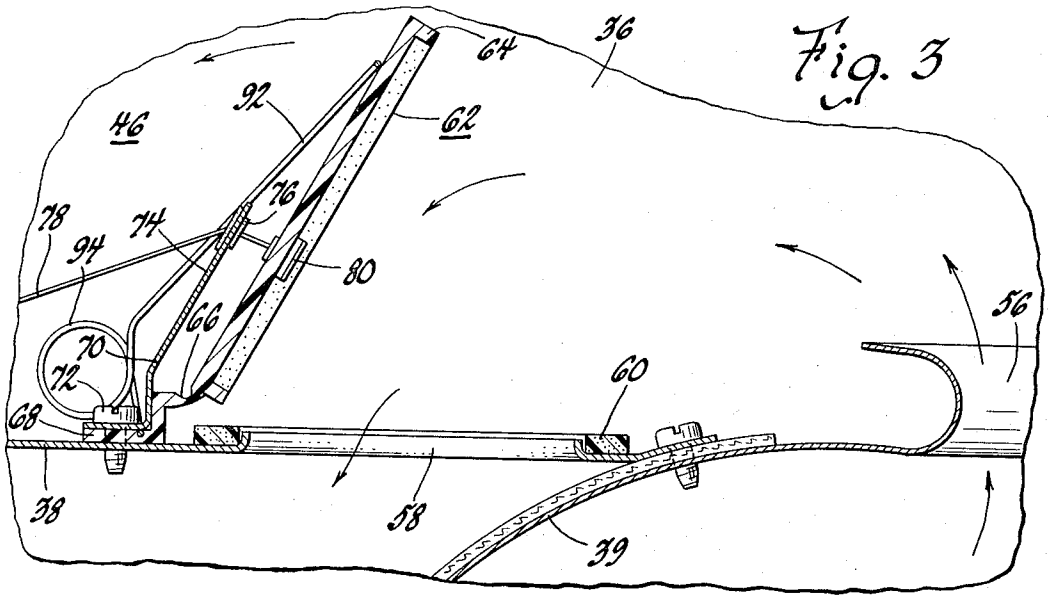


Fig. 3

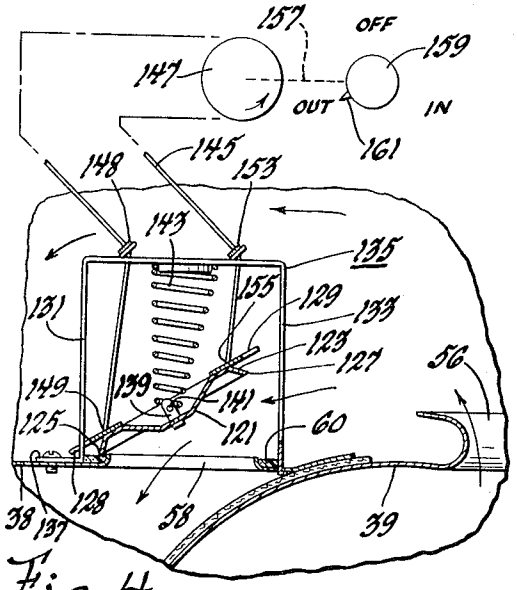


Fig. 4

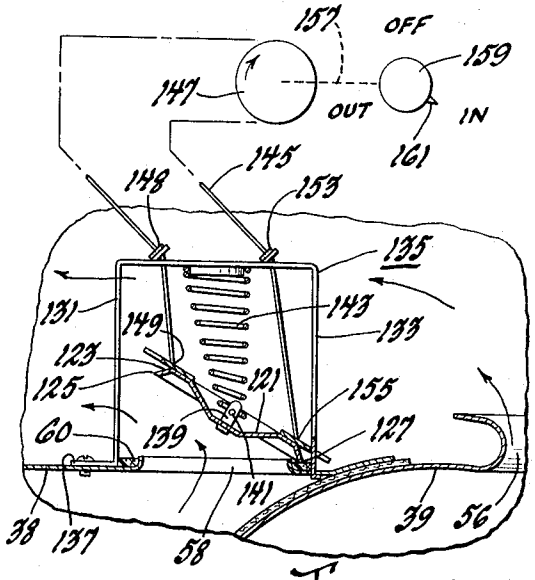


Fig. 5

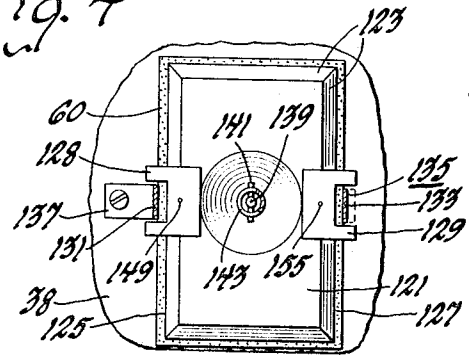


Fig. 6

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3,305,162

REFRIGERATING APPARATUS

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3 Claims. (Cl. 230—47)

This invention pertains to refrigerating apparatus and more particularly to the control of air flow in the discharge of a centrifugal fan.

In air conditioners it is frequently desired to provide a selective arrangement by which either fresh air can be drawn into the room at a selected rate, or stale or smoke-laden air discharged from the room at a selected rate which may, for example, be one-quarter of the total air circulated. Various arrangements have been proposed and used for accomplishing this, but they have been found expensive, inefficient, unsightly or cumbersome.

It is an object of this invention to provide a simple, efficient, selective door scoop arrangement cooperating with the high discharge air velocities developed from the wheel of a centrifugal fan for discharging a selected portion of the air from a room whenever desired.

It is another object of this invention to provide a simple, selective, single door venturi arrangement cooperating with the high discharge air velocities developed from the wheel of a centrifugal fan for either drawing in fresh outside air into a room or discharging stale air from a room whenever desired.

These and other objects are attained in the forms shown in the drawings in which a window type air conditioner is provided with a trap-type door in a partition wall in a chamber into which a centrifugal fan discharges air from the wheel at high velocities directly over the door. The door is arranged so that the edge extending toward the air being discharged, that is toward the fan, is lifted while the opposite edge serves as a pivot point to form an air scoop projecting into the discharge air stream for facilitating the discharge of some of the air circulated by the fan through the opening covered by the door for delivery outside the room.

In a second form, the door is arranged so that either of the opposite edges alternately serves as the pivoting edge while the other serves as the lifting edge. A selective lifting arrangement is provided so that the door may either remain closed or either of the opposite edges lifted so that the door may present itself either as a scoop to discharge air through the opening offered by the door or to present itself as a venturi creating deflector for drawing air in through the opening covered by the door.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a top view partly in section and partly diagrammatic of a window-type air conditioner embodying one form of my invention;

FIGURE 2 is a vertical sectional view taken substantially along the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary enlarged vertical sectional view of the door and door opening shown in FIGURE 2;

FIGURE 4 is a fragmentary vertical sectional view of

the 2-way door arrangement with the door open to the air scoop position;

FIGURE 5 is a view similar to FIGURE 4 but with the door shown in the venturi creating position; and

FIGURE 6 is a top view of the door shown in FIGURES 4 and 5.

Referring now to the drawings and more particularly to FIGURES 1 and 2, there is shown a window-type air conditioner having the outer casing **20** illustrated in dot and dash lines together with a sealed motor compressor unit **22**, and a fan motor **24** driving a propeller type fan **26** which draws in outside air through the louvers **28** around the sealed unit **22** and thence through the condenser **30** and out through the discharge louvers **32** at the back of the outer casing **20** into the outside air. All these portions are illustrated in dot and dash lines since they illustrate a known form of window air conditioner. This part of the air conditioner which is exposed to the outside air is separated from the inside or room air by an irregular vertical partition wall including the vertical sections **34** and **36** as well as by the horizontal section **38**. Spaced above the horizontal partition wall **38** is an inner top wall **40** which together with the end walls **42** and **44** forms a room air discharge chamber **46** having a discharge air opening **48** extending across the front.

An evaporator **50** is located in front of the inlet opening **52** of the centrifugal fan **54** which is also driven by the electric motor **24**. The sealed motor compressor unit **22**, the condenser **30** and the evaporator **50** are connected together in an operative refrigerant circuit such as may be similar to that shown in the Gould et al. Patent No. 2,945,362 issued July 19, 1960. The fan scroll **39** is provided with a discharge air outlet opening **56** coinciding with the opening in the partition wall **38** having a skewed curled edge cutoff at the throat section of the scroll. The horizontal partition wall **38** is also provided with a rectangular door opening **58** having a turned up flange surrounded by a gasket **60** of rubber-like material. This door opening **58** is located in the high velocity discharge air stream from the periphery of the fan or wheel **54** substantially in the theoretical extension of the scroll **39** in the room air discharge chamber **46** between the walls **38** and **40**. Preferably the fan or wheel **54** has forward curved blades **55** for producing the maximum high velocity discharge. The air thus discharged then flows forwardly through the opening **48** into the room. The air is drawn from the room in through the evaporator **50** and the opening **52** into the center of the centrifugal fan **54** which is rotated in a counterclockwise direction as shown in FIGURE 2 to direct the air in a counterclockwise circulation within the scroll **38** out through the opening **56** at a high velocity so that the momentum of the air will carry it toward the opening **58**.

According to a first form of my invention, as is better shown in FIGURE 3, I provide a flapper type door **62** which may be made of a flexible plastic material having downturned edges **64** which when the door is closed extend into sealing engagement with the gasket **60** to seal the opening **58**. The door **62** is provided with an integral flexible hinge **66** forming a pivot or hinge section which connects to an angle-shaped anchoring section **68**. This angle-shaped anchoring section **68** is held in place by a bent sheet metal bracket **70** which extends over the anchoring section **68** and is fastened by a pair of screws **72** to the partition wall **38**. The bracket **70**

includes an extension 74 extending upwardly at an angle over the edge of the door containing a plastic eyelet 76. A cord or cable 78 has one end anchored by the anchorage 80 to a central portion of the door 62 and extends through the eyelet 76 and an eyelet 82 in the wall 38 and an eyelet 84 in the wall 34 to a drum 86 on which it is wound and fastened. The drum 86 is fixed to a shaft 88 which is adapted to be selectively manually turned by an external knob 90.

Extending toward the edge of the door nearest the fan 54 is a mouse-trap type spring 92 having a curled portion 94 over the anchoring section 68 and having projecting ends anchored beneath the clamping portion of the bracket 70. The door 64 has a generally rectangular shape and the edge which is nearest to and parallel to the axis of the fan 54 is lifted against the tension of the spring 92 when the knob 90 is turned to wind the cord or cable 78 upon the drum 86. The shaft 88 is provided with sufficient friction to hold the drum 86 in any adjusted position.

The door 62, for example, may be lifted to the position shown in FIGURES 2 or 3 wherein it presents itself as a scoop projecting into the discharge air chamber 46 partially blocking the flow of air and partly scooping the air which is discharged at high velocity onto its lower face through the opening 58 into the outdoor air portion of the window air conditioner wherein is located the sealed motor compressor unit 22 and the fan 26. This will discharge stale and smoke-laden air from the room in a proportion of as much as one-fourth of the air circulated by the fan 54. When the stale smoke-laden air is removed from the room, the knob 90 may be turned to unwind the cord 78 from the drum 86 to allow the door 62 to be closed by the spring 92 against the gasket 60.

In the modified form of the invention shown in FIGURES 4 to 6, an arrangement is provided by which the single door can be operated either to discharge air from the room through the opening 58 or to draw air from the outside through the opening 58 into the room. To accomplish this the sheet metal door 121 is made generally rectangular in shape with downwardly turned edges 123 adapted to make sealing engagement with the gasket 60. At their central point the two edges of the door 125 and 127 parallel to the axis of the fan 54 are provided with U-shaped projections 128 and 129 which slidably engage respectively the upwardly extending legs 131 and 133 of an inverted U-shaped guide member 135 having outturned feet 137 at the bottom which are fastened to the partition wall 38.

The center of this door is provided with an upwardly extending pin 139 having a cross pin 141 extending parallel to the edges 125 and 127. Extending over the top of the pin 139 and resting on the transverse pin 141 is the lower end of an inverted compression type conical coil spring 143 having its upper end fitted over a central extruded flange extending downwardly from the transverse top of the inverted U-shaped member 135. This conical coil spring 143 applies a resilient downward force on the center of the door and normally holds the door 121 in closed position with the downturned edges 123 in sealing engagement with the gasket 60.

For the purpose of opening the door 121 in either direction, there is provided a cord 145 having its intermediate portion wrapped around the drum 147 a sufficient number of times to prevent slippage. One end of the cord is connected through an eyelet 148 located in the transverse section of the inverted U-shaped member 135 to an anchorage 149 connecting with the guide 128 adjacent the edge 125 of the door 123, while the other end of the cord extends through an eyelet 153 to an anchorage 155 in the U-shaped guide 129 adjacent the edge 127 of the door. The drum 147 is connected by a shaft 157 to a knob 159 provided with an indicating pointer 161. When the knob 159 is turned so that the pointer is up toward the OFF position, the door 121 will be closed.

When the knob 159 and the drum 147 is turned counterclockwise to the OUT position, the edge 127 of the door will be lifted as shown in FIGURE 4 so as to present the door 121 as a scoop projecting into the space 46 between the partition walls 38 and 40 so as to discharge a portion of the air circulated by the fan 54 out through the opening 58 as indicated. When the knob 159 and the drum 147 are turned clockwise as in FIGURE 5, to place the pointer at the IN position, the edge 125 of the door 121 which is farthest from the fan 54 and the opening 56 will be lifted as shown in FIGURE 5. The door 121 in this position projects itself as an air deflector into the space 46 between the walls 38 and 40 to create a zone of low pressure by a venturi action or suction which will draw in air from the outside through the opening 58 into the air stream discharged from the fan 54 through the discharge chamber 46 into the room. Thus in this second form of the invention a single control knob and winding arrangement operates a single door to either keep the door closed or to discharge air from the room to the outside or to draw in outside air in the room selectively as desired.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. An air flow arrangement including a partition wall having a first opening therein, a centrifugal fan having its axis substantially parallel to and substantially spaced from said wall and having its periphery adjacent said opening and positioned to discharge air through said opening and preponderantly in one direction generally parallel to said wall, said wall having a second opening spaced from said first opening and aligned with said first opening, a door for closing said second opening, and selective means for lifting the edge of the door nearest said first opening away from said partition wall to present the door as a scoop extending into the path of the air discharged from the periphery of said centrifugal fan to cause some of the air discharged to flow through said second opening, said selective means also including means for lifting the edge of the door farthest from said first opening away from said partition wall so as to present the door as a venturi creating deflector for drawing in air through said second opening.

2. An air flow arrangement including a partition wall having a first opening therein, a centrifugal fan having its axis substantially parallel to and substantially spaced from said wall and having its periphery adjacent said opening and positioned to discharge air through said opening and preponderantly in one direction generally parallel to said wall, said wall having a second opening spaced from said first opening and aligned with said first opening in said one direction from said first opening, a second wall substantially parallel to and spaced a substantial distance from said partition wall on the side opposite said fan and opposite said first and second openings, a generally rectangular door for closing said second opening having parallel edges substantially parallel to the axis of said fan, said fan having a generally spiral shaped scroll with the theoretical extension of said scroll continuing in the direction of said door for directing the discharge of air toward said door, and selective means for lifting the edge of said door substantially parallel to and nearest the axis of said fan away from said partition wall to present said door as a scoop extending into the path of the air discharged from said centrifugal fan in between said walls to cause some of the air discharged to flow through said second opening, said selective means also including means for lifting the edge of the door substantially parallel to and farthest from the axis of said fan away from said partition wall so as to present the door as a venturi creating deflector between the walls for drawing in air through said second opening.

3. An air flow arrangement including a centrifugal fan having an axis and a discharge duct having a wall along which the discharge air flows, said wall being provided with an opening, a door for closing said opening, and selective means for lifting the edge of the door nearest the fan away from said wall to present the door as a scoop extending into the path of the discharge air flow to cause some of the air to be discharged through said opening, said selective means also including means for lifting the edge of the door farthest away from said fan away from said wall to present the door as a venturi creating deflector for the drawing in air through said opening.

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